

## EDITORIAL ARTICLES.

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### LAUENSTEIN ON STRANGULATION OF THE TESTICLE FROM TORSION OF THE SPERMATIC CORD.<sup>1</sup>

CONCERNING this accident, of which so little has been written, Lauenstein says that it was first described by Nicoladoni,<sup>2</sup> in 1885. By a torsion of 180° and more, so great a circulatory disturbance is created that changes in the tissue of the testicle are brought about which very closely resemble the hæmorrhagic infarctions of the intestine, caused by emboli in the arteria mesaraica.

The first of Nicoladoni's cases was that of a sixteen-year-old laborer, who had had no testicle in the right side of the scrotum. When twelve years of age he had suffered with a severe attack of pain for the first time in the right inguinal canal. At that time a tumor, the size of a bean, had protruded slightly from the external ring. After a few hours the tumor and the pain disappeared. Several such attacks occurred during the course of the next year. Finally, a tumor the size of a hickory-nut appeared, which was very tender on pressure. Three days later the patient came to Nicoladoni's clinic. Examination showed a tumor in the right inguinal canal. It was firm, unmovable and painful, and about the size of a walnut. Under the application of ice the pain diminished, but the tumor did not disappear. The patient did not care to go through another attack of "periorchitis," and operation was performed. The tunica vaginalis was exposed. It contained, besides a small amount of bloody serum, the testicle, which was flatly compressed, pear-shaped, and bluish-black in color. Its posterior surface was adherent to the tunica. The

<sup>1</sup> Sammlung klinische Vorträge, No. 92, 1894.

<sup>2</sup> Nicoladoni: Die Torsion des Samenstranges, eine eigenartige Komplikation des Kryptorchismus. Archiv für klinische Chirurgie, Bd. XXXI, 11.

spermatic cord, which was two centimetres in length, was twisted from right to left  $180^{\circ}$ . This was removed, and the wound healed promptly. The cord, which was three-quarters of a centimetre thick, was made up of the vas deferens and vessels. The funiculus spermaticus was completely free, and was nowhere held by a peritoneal fold. Examination of the atrophic testicle showed no sign of a primary inflammation, but, on the other hand, there was a good deal of hæmorrhagic infiltration of the organ.

The second observation of Nicoladoni's was of a sixty-two-year-old laborer, who presented himself at the clinic with a swelling of the right side of the scrotum. The swelling had appeared a few days before, after hard work, and was accompanied with pain and vomiting. There was some redness, œdema, and fluctuation. The diagnosis of purulent periorchitis was made, and incision practised. The tunica vaginalis propria contained, instead of pus, 200 grammes of hæmorrhagic fluid, and a testicle which was enlarged, darkly discolored, and rotated more than  $180^{\circ}$  on its pedicle. This case also was cured by removal of the testicle. The testicle was flattened. The enlarged epididymis contained two large cystic cavities, and the whole organ was the seat of hæmorrhagic infiltration.

The conclusions at which Nicoladoni arrived were that the accident of torsion may occur both in the descended and undescended testicle.

Chauveau experimented on rams, and found that the testicle became atrophic after artificial twisting of the cord. Gangrene occurred only in those cases in which septic matter had been introduced into the vessels before the torsion was practised. Such an atrophy may occur after operation for varicocele. It is a fact of historic interest that the Montpellier surgeon, Delpech, was murdered, in 1832, by a patient on whom he had operated for a double varicocele, and who as a result of the operation suffered atrophy of both testes.

Cases have been reported now and then as "acute periorchitis," in which, instead of pus being discovered, the tunica vaginalis propria was found to contain only hæmorrhagic fluid, and an enlarged

and discolored testis. Volkmann<sup>1</sup> made such an observation as this in 1877. His was the case of a boy fifteen years of age, who, after hard labor, had been suddenly seized with vomiting and pain in the left side of the scrotum. Acute inflammation was suspected. An incision revealed a greatly-enlarged and discolored testicle, with marked dilatation of the spermatic vessels. In the course of time the testicle became gangrenous and was exfoliated. Volkmann did not discover the cause of the infarction.

These observations incited certain observers to make experiments with the vessels of the testicle. Miflet<sup>2</sup> has reported eighteen experiments upon dogs. Artificial emboli were caused in seven cases; the arteria spermatica interna was ligated in four cases; in five cases the artery and vein were both tied; and in four cases the vena spermatica interna alone was ligatured. In two of the first seven the arteria deferentialis was ligated. As a result of these experiments, the following deductions were made:

(1) The arteria spermatica interna bears to the testicle the relation of an end artery in the sense of Cohnheim.

(2) The checking of the blood-supply to the testicle through the internal spermatic artery by ligation or by embolism is quickly followed by the formation of hæmorrhagic infarction. These infarcta involve especially the superficial layers of the testicle.

(3) The glandular tissue of the testicle is especially sensitive to circulatory disturbances in the vessels of the spermatic cord, not only by simultaneous ligation of both the internal spermatic artery and the spermatic veins, but also by the slightest circulatory hinderance in veins alone. The glandular tissue immediately degenerates, and an atrophy of the organ results.

(4) The epididymis, which is supplied by the arteria deferentialis,

<sup>1</sup> R. Volkmann: Ein Fall von akutem hæmorrhagischen Infarct und Spontangangrän des Hodens. Berliner klinische Wochenschrift, 1877, No. 53.

<sup>2</sup> Joseph Miflet: Über die pathologischen Veränderungen des Hodens, welche durch Störungen der lokalen Blutcirculation veranlasst werden. Archiv f. klin. Chir., Bd. 24, XXIII.

is not at all or but slightly affected by obstructing the circulation of the internal spermatic artery.

(5) When the circulation in both the internal spermatic and the deferential arteries is shut off, the epididymis also undergoes complete degeneration.

Following these observations, a third case was reported from the clinic of Helferich, in Greifswald. The patient was a young man, who had at the ages of fourteen and nineteen respectively suffered an attack of pain in the right inguino-scrotal region, and who was admitted to the clinic in 1889, at the age of twenty-one, with the diagnosis of strangulated inguinal hernia. Four days before his admission he had been suddenly seized in the night with severe inguinal pain, and attributed the same to his jumping over a ditch on the day before. The painful inguinal swelling was treated with ice and laxatives. The right testicle was not in its normal place in the scrotum. At the inner two-thirds of Poupart's ligament was a tender, elastic tumor about the size of a pigeon's egg. In the upper part of this was a resisting body, which seemed to be the testicle. The patient's temperature was 37.8° C. Under treatment with ice, laxatives, and morphine, neither the pain nor the swelling abated. On the third day Helferich operated. A pipe-shaped cystic sac was exposed, which extended to a narrow pedicle in the direction of the internal inguinal ring. In this sac he found a blood-stained fluid and a swollen, dark-red testicle with its cord twisted to the left 360°. The testicle lay in the upper part of the sac with its upper pole directed downward. From its under surface the cord passed from above and without downward and inward to the inguinal canal. The testicle and cord were free in the sac. The cord was ligated and the testicle removed. Microscopic examination of the testicle showed it to be the seat of hæmorrhagic infarction throughout. The outer layer showed a beginning necrosis.

The fourth case in the literature came from the clinic of Mikulicz,<sup>1</sup> in Königsberg, in 1890. A four-year-old boy was admitted

<sup>1</sup> Hans Gervais: Ein Fall von Torsion des Samenstranges. Inaug. Dissert., Breslau, 1891.

who had fallen six days before a distance of twelve feet. He was unconscious after the fall, and had sustained a trivial scalp wound. Two days after the fall he began to complain of pain in the lower left part of the body. On the third day swelling and redness of the scrotum developed, which continued till he was admitted to the clinic. There also was some swelling along the line of the left spermatic cord. In the right side of the scrotum an apparently normal testicle could be felt; in the left side was a tense, tender tumor, adherent to the skin. The swelling extending up into the inguinal canal seemed due to an enlargement of the cord. In the diagnosis of this case traumatic inflammation was out of the question, because there was no sign of local injury. There was too little fluctuation for hæmatocele or hydrocele. The excellent condition of the child's general health excluded constitutional disease. Mikulicz diagnosed torsion of the pedicle of a lately-descended testicle. He opened the tunica vaginalis propria, which was found to contain a yellowish fluid and the testicle, which was about the size of a hazel-nut and of a dark purple color. On the head and body of the epididymis were distended veins. The tail of the epididymis and the beginning portion of the cord were twisted  $360^{\circ}$ . The organ was easily untwisted. The color improved somewhat, and no resection was performed. Convalescence was complicated by an attack of measles. A portion of the testicle became necrotic and was exfoliated.

The fifth observation was made by Whipple,<sup>1</sup> in 1891. A young man, sixteen years of age, was admitted to the hospital with the following history: Seven years before he had noticed a lump in the left groin which disappeared into the abdomen. On the day before his admission to the hospital he had fallen over and felt something give way in the left groin. Next day vomiting developed, and the bowels moved after two days of constipation. An hour-glass-shaped tumor could be felt in the groin. The lower part of the tumor contained the testicle, which occupied the upper part of the scrotum. The

<sup>1</sup> Whipple: Strangulated epididymis of incompletely-descended testis, producing symptoms like those of strangulated hernia; castration; cure. *Lancet*, May 16, 1891.

upper part of the tumor, which lay over the outer inguinal ring, was the size of a hen's egg, very tense, tympanitic, and gave no impulse on coughing. In the upper part of the tumor, besides bloody fluid, was the enlarged, dark-red, strangulated epididymis. The true testicle lay in the lower part of the tumor. To it was adherent a string of omentum. The epididymis was twice twisted on its axis. The further operative procedure consisted in removing the testicle with the string of omentum. The stump of the cord and omentum were shoved back into the abdomen, the sack tied off, and the outer ring and the superficial wound closed.

The sixth case was reported from Czerny's clinic, in Heidelberg.<sup>1</sup> A youth, eighteen years of age, had been seized on sneezing with a severe pain in the right testicle, which was situated just without the outer inguinal ring. He immediately developed local tenderness, vomiting, pallor, feeble pulse, profound prostration,—in short, symptoms of strangulated inguinal hernia. Later developed swelling, and the testicle was separated from the outer ring by a furrow. A diagnosis of compressed varicocele was made, and the testicle and cord were exposed by a longitudinal incision. The tunica vaginalis propria was found to contain blood-clots, and the testicle had the appearance of a gangrenous intestine. It was twisted from right to left one and a half turns. It was not removed because of the atrophic testicle on the other side. Four months later the patient again presented himself at the clinic. The right testicle lay at the root of the penis. It was quite fixed, of firm consistence, and three centimetres long by 2.5 centimetres thick. The left testicle was larger than normal and in normal position. Czerny did not believe that the organ had been restored to function by the operation, but expected that it would become atrophied.

The seventh case was reported by Thomas Bryant.<sup>2</sup> He saw, in

<sup>1</sup> Edward von Meyer: Ein Fall von Torsion des Samenstranges mit Erhaltung des Zurückgedrehten Hodens. (Aus der chir. Klin. zu Heidelberg.) Deutsche medicinische Wochenschrift, 1891, No. 25.

<sup>2</sup> Thomas Bryant: Torsion of the spermatic cord with strangulation of the testicle. British Medical Journal, February 27, 1892.

1889, an incompletely-descended testicle of the left side in a young man fifteen years of age. The case at first resembled strangulated hernia, and was at once subjected to operation. The testicle was almost black, and the spermatic cord was found twisted upon its axis one and a quarter times. It was easily untwisted, and, as it remained warm, the operator decided to leave it. A rapid atrophy was the result.

An eighth case was reported by Herbert Page,<sup>1</sup> and was that of a seventeen-year-old youth who had been admitted to the hospital with symptoms of strangulated inguinal hernia of the right side. He had been seized during the night with severe pain in the testicle and vomiting. At the same time the bowels became constipated, the tumor became larger, tender, red, and cedematous. The possibility of orchitis was suspected. On the fourth day operation was performed. The testicle was black and gangrenous, the epididymis was much swollen, and the spermatic cord was twisted from left to right two turns. It was easily untwisted. The torsion was just at the external ring. No cause for the accident could be ascribed. The cord was ligated and the gland removed. Page has laid especial stress upon the difficulty of diagnosis because of the great resemblance of the case to strangulated hernia. He believes with Bryant that many cases of atrophy of the testicle are due to torsion of the pedicle. He observes that in such cases all of the signs of inflammation are present,—tumor, calor, rubor, dolor,—yet no pus is found.

The ninth case in the literature was reported by Anders.<sup>2</sup> The patient was a thirteen-year-old boy whom he saw for incarcerated hernia, and found a tense tumor of the left groin and cryptorchism of the left side. An incision exposed a tumor the shape of a fish's bladder. The sac contained a clear fluid and a bluish-red tumor, which protruded partially through the external ring and was tightly grasped by the same. After splitting the ring it was discovered that the tumor was a gangrenous epididymis, which spontaneously twisted one

<sup>1</sup> H. Page (St. Mary's Hospital): Twisted spermatic cord and gangrene of testis. *Lancet*, July 30, 1892.

<sup>2</sup> E. Anders: Kastration eines durch Torsion nekrotischen Leistenhodens. *St. Petersburger medicinische Wochenschrift*, 1892, No. 47.

and a half turns. The testicle and a portion of the tunica vaginalis were extirpated. This patient had worn a truss for five years for the supposed hernia. An interesting feature of this case is the isolated twisting of the epididymis and the fact that it untwisted spontaneously as soon as the ring was cut. Nothing was said about the direction of the torsion. Lauenstein supposes that the truss had something to do with the torsion or with the strangulation by the external ring.

A tenth case is that reported by A. E. Barker.<sup>1</sup> The patient was fifteen years of age. His right testicle was small and not completely descended, and since his seventh year he had had a hernia of the same side. After a stool he was unable to return the hernia. During the two following days vomiting occurred. On the third day he had to go to bed, where he remained till he was removed to the hospital eight days after the accident. He presented the symptoms of local swelling and pain. The tongue was dry, pulse 96, temperature 102.2° F. The right testicle was two inches below the external ring, about which was considerable swelling. Above this was an oval swelling representing the canal. The overlying skin was dark and œdematous. The abdomen was not tender. During the seven days there had been no movement of the bowels. A diagnosis of omental hernia was made. At the operation, from the supposed hernial sac escaped some bloody serum and clots; and the flat, tense and dark, livid testicle was found twisted one and a half turns upon its pedicle from without inward. There was no hernia. The twist was removed and the gland excised. After the operation the temperature fell to normal.

To these Lauenstein adds a case of his own. The patient was a twenty-five-year-old laborer, who, while busy at work, was suddenly seized with a severe pain in the right inguinal region which made him unfit for further work. While being carried home he vomited once. During the following night he vomited three times. On the second day he was removed to the hospital. The history was elicited

<sup>1</sup> A. E. Barker (University College Hospital): A case of torsion of the spermatic cord with strangulation of the testicle. *Lancet*, April 8, 1893.

that he had but one testicle and that on the left side. He had never before had such an attack. Above and along the right ligament of Poupart was a tense, elastic tumor the size of a hen's egg. It was painful and tender, and gave, on percussion, a short, tympanitic note. The abdomen gave no symptom. No testicle occupied the right scrotum; while the left was normal. The cremasteric reflex was normal on the left side, but was entirely absent on the right. The tongue was coated, otherwise the constitutional signs were normal. Temperature  $38^{\circ}$  C. The diagnosis of torsion of the right testicle was made, though strangulated omentocele and appendicular abscess were considered. The patient's bowels had moved, so that strangulated enterocele was not taken into account, though a Littré's hernia was thought of. There was, in Lauenstein's opinion, no urgent indication for operation, so the patient was treated with opium suppositories, ice applications, and fluid diet. After this treatment was instituted the patient vomited but once, the tumor gradually became smaller. The pain, tenderness, prostration, and insomnia did not improve, so on the fifth day after the onset of the attack, an operation was performed.

An incision was carried parallel with Poupart's ligament. A sac was opened from which escaped some darkly-stained serum. In this sac was discovered the dark-blue testicle. The cyst reached from the spine of the pubes to about two fingers'-breadths above the level of the anterior superior iliac spine. It lay within the sheaths of the abdominal wall and was covered with serous membrane. This cavity was divided into two parts, of which the outer was considerably larger than the median. In the latter was the darkly discolored testicle with the epididymis directed upward. Directly at the insertion of the spermatic cord was a torsion of  $180^{\circ}$  from left to right. The outer compartment of the sac contained clear serum.

On untwisting the cord the gland did not improve in color; it was, therefore, removed. The testicle, from the head to tail of the epididymis, measured six and a half centimetres long, four and a half centimetres high, and two and a half centimetres thick. The cut surface of the gland looked like a blood-clot. Microscopic examina-

tion showed that the whole structure was filled with blood,—the connective-tissue spaces and seminiferous tubules.

The fact that these cases varied between the ages of four and sixty-two years of age would indicate that the age has little to do with this disease. Six cases involved the right side. All of these testicles must have been abnormally movable. There was a history of previous attack of strangulation of the testicle in two cases. In five cases there was a distinct exciting cause. A jump over a ditch on the previous day, a fall of twelve feet three days before, sneezing, and hard manual labor, were the causes assigned. In all of the cases the attack came on suddenly, and the pain was invariably severe. The torsion of the cord presented the same picture in all cases. The testicle was shiny, darkly discolored, more or less swollen, and surrounded by yellow or bloody fluid. The testicle spontaneously untwisted as soon as it was relieved from constricting influence. The hæmorrhagic infarction was in all cases unquestionably due to the twisting of the pedicle.

Kocher<sup>1</sup> is of the opinion that the separation of the funiculus into two segments has much to do with causing this accident. In the Mikulicz-Gervais case it is stated that the tail of the epididymis had become twisted about the beginning portion of the vas deferens. Lauenstein is of the opinion that the shortness of the cord may have something to do with the accident. In Nicoladoni's first case the cord, which was twisted 180°, measured but two centimetres long. In the cases of Whipple and Anders there was an isolated torsion of the epididymes, which can probably be regarded as being due to congenital misformation. The flat form of the testicle may also have something to do with the occurrence, or rather with the maintenance of the deformity.

The direction of the torsion is noted in six of the above cases. Five of these show a left spiral twist. Four of the cases involved undescended testes of the right groin, and one a testicle just outside of the outer ring.

<sup>1</sup> Kocher: *Die Krankheiten der männlichen Geschlechts-organe*. Stuttgart, Ferd. Enke, 1887.

The cause of the accident is attributed to mechanical movements of the organ by walking, jumping, etc.

Of chief importance is the diagnosis. In all of the reported cases the symptoms simulated some inflammatory process. The onset was very sudden, and followed by pain, local swelling, œdema, redness, and fever. The sudden onset was usually followed by reflex disturbance, especially vomiting.

Lauenstein draws the following conclusions from these observations:

(1) Up to date at least eleven cases of the disease designated by Nicoladoni as torsion of the spermatic cord have been reported. A number of such cases have probably been reported as "strangulation of the testicle" and "acute periorchitis."

(2) The explanation of the occurrence of hæmorrhagic infarction of the testicle due to torsion of the pedicle was first made by Miflet under the direction of Volkmann.

(3) The predisposing cause of the accident is the freedom of the testicle as it hangs like a fruit from its stem. This torsion may occur not only in the inguinal testicle, but also in the case of the testicle the descent of which into the scrotum has been delayed.

(4) The conditions which favor the accident are flat form of the testicle, the *inversio testis horizontalis* (Kocher), division of the cord into two sections, broad arrangement of the parts of the cord, or abnormal shortness of the cord.

(5) It is a question whether the exciting cause lies in the ordinary movements of the body or is to be assigned to some sudden and abrupt jarring.

(6) The fact that in five cases of right-sided inguinal testicle a left spiral twisting of the cord took place is similar to the observation of Küstner, that right-sided ovarian tumors tend to undergo a left spiral torsion of the pedicle, and ovarian tumors of the left side tend to undergo a right spiral torsion.

(7) The diagnosis of torsion of the testicle on account of the suddenness of the attack, and the possible co-existence of hernia of

the intestine or omentum may be confused with that of the latter condition. Abscess of the appendix vermiformis is also to be borne in mind.

(8) The strangulated inguinal testicle must be removed. The scrotal testicle may be left if the circulation is not too greatly disturbed.

(9) Because of the fact that this disease is not common, and is, moreover, rather difficult of diagnosis, when cases of this sort are met they should be studied with especial care, with the view of throwing more light upon this subject.

Lauenstein made a correct diagnosis in the case which he has reported, yet he states further on that there seemed to be no urgent indication for operation, so he treated the patient with opium and ice, and did not operate till the end of five days. There seems to be some inconsistency here, for he was certainly aware of the harm which procrastination was doing.

To the above table of cases should be added the Davies-Colley<sup>1</sup> case.

In the *ANNALS OF SURGERY*, May, 1894, is a paper by Johnson, in which the meagreness of the literature upon this subject is commented upon, and in which is appended an abstract of the history of an additional case.

JAMES P. WARBASSE.

#### FISCHER ON SUPPURATIVE INFLAMMATIONS IN THE SUBUMBILICAL SPACE.<sup>2</sup>

THE author begins by calling attention to the fact that the periumbilical region, so interesting from a surgical stand-point, may be subdivided into the supraumbilical region, following the course of the

<sup>1</sup> British Medical Journal, April 6, 1892; the cases of Langton (*St. Bartholomew's Hospital Reports*, Vol. xvii, p. 88), Nash (*British Medical Journal*, April 3, 1893), Cohen (*Deutsche Zeitschrift für Chirurgie*, 1890, p. 101), Owen (*Lancet*, November 18, 1893, p. 1247), and Johnson (*ANNALS OF SURGERY*, March, 1893).

<sup>2</sup> H. Fischer (Berlin): *Die Eiterungen im subumbilicalen Raume. Sammlung klinischer Vorträge*, No. 89.